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# Terms of Reference

# Cumulative Impact Assessment and Optimized Water Management in Selected River Basins

# Renewable Energy Development Project

## Background

*<Rationale for the project, objective of the project, environmental safeguards framework, energy sector in the country, energy demand, aims of the project, project components.>*

## Objective of the Study

The objective of this assignment is to carry out Cumulative Impact Assessment (CIA) and Optimized Water Management for the [number] rivers funded under the project.

## Scope of Works

The study will be conducted in three phases in which first all rivers are screened for potential significant cumulative impacts and as a second phase the affected rivers are studied in more detail. The results of the screening will guide to what level detailed studies are needed for each river. The results of the cumulative impacts analysis shall be the basis for the third phase of the study which is the development of joint operation rules for each of the rivers.

The scope of the study should cover spatial and temporal dimensions relevant to cumulative impacts and take into account short, medium- and long-term strategic planning in the [number] river basins. The development scenarios assessed should include all relevant sectors and key issues.

#### Phase I – Screening

Task 1– Start-up and Review of Documents:

The Consultant shall conduct start-up meetings with the [ministry in charge of trade and industry] and the project team to compile all relevant documents and up-to-date information on planned projects. The Consultant shall review all related documents including the project’s Environment Safeguard Framework, [country]’s laws and regulations on environmental and biodiversity protection as well as water resource management, and the [donor]’s safeguard operational policies.

A compilation of general maps and thematic data should be made for the [number] rivers. Subproject documents for the schemes approved or reviewed under the project such as approved Environmental and Social Impacts Assessment (ESIA), Environmental Management Plan (EMPs) and Resettlement Action Plans (RAPs), hydrology and flow analysis shall help the Consultant to acquire information and baseline data.

After completion of documents reviewing and data inventory, the Consultant shall prepare an Inception Report which shall confirm the methodology and deliverables of the study. The Inception Report shall include an updated scope, if necessary, and a final project work plan and schedule, and highlight any problems or constraints associated with the study.

Task 2 – Interaction with the [ministry in charge of natural resources and environment], people committees and other relevant stakeholders:

The Consultant shall have meetings with the [ministry in charge of natural resources and environment], which has the main responsibility of river basin management in [country] together with the local people committees, to present the project and seek cooperation in the project activities and data and information compilation. The Consultant shall compile information on the legal and institutional framework of water resources management in [country] as well as information on the main actors and current activities related to river basin management in the [number] rivers.

Task 3 – Desk Study to Identify Stressors and Valued Ecosystem Components (VECs): The Consultant shall conduct a desk study to identify and describe all existing or reasonably foreseeable investments, facilities or activities (“stressors”) which have impacts on the river flow regime or its water quality in the [number] rivers. This will include a preliminary estimation, based on previous studies and areal information, of natural and regulated flows as a result of existing or planned hydropower plants and abstraction for other purposes. It will also include a preliminary identification of possible sources of sediment or contaminants that may potentially harm water quality in the [number] rivers.

The Consultant will subsequently, based on thematic data and previous studies, identify the potential receptors of negative impacts from the operation of the stressors in the [number] rivers. This would include all VECs which could be significantly adversely (or also positively) impacted. In the project context VECs would be mainly those most vulnerable to hydrological or water quality changes that affect the flow regime, aquatic and riverine ecosystems and economic activities and livelihoods depending on water from the [number] rivers (e.g. fisheries, irrigated agriculture). The nature of the impacts will be described and their scale assessed in a qualitative manner.

Task 4 – Site Visits and Qualification of Desk Study:

Guided by the results of the desk study the Consultant shall conduct site visits to the [number] rivers. The site visits shall as a minimum include visits to the major existing and planned hydropower plant sites and other essential interventions in the basins that may affect water flow and quality. Impacts such as flow regulations, increased erosion or possible contaminant sources shall be investigated. During the visits potentially impacted VECs shall be assessed and as much consultations as possible should be made with the local people committees, local communities and governments. Standard water quality measurements (pH, conductivity, DO, susp. sediments) should be conducted along the rivers during site visits and existing river flow gauging and water quality monitoring stations should be visited and evaluated. Based on the findings of the site visits the Consultant shall update and qualify the desk study results and conclusions.

Task 5 – Risk Ranking and Screening Report:

The Consultant shall, based on the findings of the desk study and the site visits, conduct a risk ranking in terms of additional cumulative impacts created by the projects. Each of the [number] rivers shall be described in regards to stressors and their potential impacts on VECs. If significant impacts are identified preliminary estimates should be made on which specific HPP(s) or other interventions are the most likely cause. The rivers should be ranked based on potential impact and recommendations should be made on what methodology, and what level of detail should be applied, as well as what geographical areas, period of time and sectors to consider, for further studies in each of the basins.

The results and conclusions shall be summarized for each of the [number] rivers in a draft Screening Report. The draft report shall be presented at a workshop including the [ministry in charge of natural resources and environment], the [ministry in charge of trade and industry] and other stakeholders. Based on the outcome of the workshop the Consultant shall finalize the screening report and it shall be agreed how and to what level of detailed studies should be conducted for each river.

#### Phase II – Detailed Cumulative Impact Assessments

Task 6 – Detailed Hydrological Assessment:

For the rivers where a detailed hydrological assessment shall be conducted, all hydrological data should be compiled and quality assessed. In addition rainfall and evaporation data shall be collected at a level of detail to allow hydrological modeling on a daily or weekly time scale.

In the case of historical artificial influence such as flow regulation or abstractions, data and information on these will also be collected. The compiled data shall be used to set up and calibrate a hydrological model for the chosen river basins. Once satisfactorily calibrated, it will be used to simulate natural (virgin) river flows in the rivers.

Task 7 – Detailed Water Balance Analysis:

The Consultant shall compile all available information on existing and planned HPP and other interventions that impact on river flows in the rivers for detailed hydrological studies. Information and data on standard intake capacities, operation rules and abstraction schedules should be compiled. Based on the compiled information a set of scenarios shall be defined. As a minimum these scenarios should include natural conditions, existing conditions and future conditions with or without the project schemes. If relevant, scenarios including major regulating facilities should be run during construction and operation mode as well as with or without environmental flow releases. Using the natural hydrological river flows as input the artificially influenced river flows shall be simulated through a water balance model under these scenarios. Flow series for the different scenarios for key points in the river basins (e.g. at the location of potential VECs) shall be simulated. Energy production from HPP should be calculated for each scenario.

Task 8 – Detailed Erosion, Sediment Transport and Water Quality Assessment:

The Consultant shall compile data on soil characteristics and erodibility for the river basins to be studied in detail in regards to erosion and water quality. Based on data from adjacent river basin or regional studies estimates of natural riverine sediment transport shall be made. The Consultant shall compile information on land use and land degradation in the river basins. Special emphasis should be given to the potential effects of access roads for increased landslides and erosion at the existing and planned HPPs. Based on these assessments, an identification of potential artificial point or diffuse sources of riverine sediments and their magnitude shall be estimated under the scenarios defined in Task 7. Similarly, potential point sources of contaminants from existing or planned HPP and other interventions to the river system shall be identified and as much as possible quantified. Through integration with the calculated river flows in Tasks 6 and 7 the order of magnitude for sediment and contaminant concentrations shall be established at key points in the river basins.

Task 9 – Description of Physical Cumulative Impacts:

The Consultant shall summarize the results of Task 6-8 in a report including graphical descriptions of the physical characteristics (e.g. average flows, minimum flows, sediment concentrations, etc.) along the rivers under the different scenarios. Results shall be quantified for key points along the river stretches. Emphasis should be given to describe the additional effects of the project schemes.

### Task 10 – Assessment of Environmental and Social Impacts:

Based on the estimated physical cumulative impacts in the river basins where detailed studies are required, stretches with a combination of VEC and significant effects on either flow regime or water quality shall be assessed in regard to environmental or social impacts. Potential effects on aquatic biodiversity should be estimated based on knowledge from previous national and regional studies. If necessary, sampling of fish and other aquatic species shall be conducted at key sites. In situ water quality measurements should be conducted as much as possible to complement the measurements done during the screening phase. In parallel, the use of the river and the aquatic life for ecosystem services by local communities should be assessed through consultations. The economic dependency of the rivers and the potential impacts of the simulated physical cumulative impacts under the different development scenarios should be estimated. Liaison with the people committees is important for this task.

### Task 11 – Potential Mitigation Measures:

The Consultant shall base on the results of Task 9 and 10 suggest possible mitigation measures for identified negative cumulative impacts. As a first step the Consultant shall propose improvements to the existing ESF and the existing EMPs for the projects to as far as possible mitigate any cumulative impacts. As a second step the Consultant shall recommend improved joint operation and management of the rivers, e.g. through establishment of jointly agreed operational rules including environmental flows and minimum abstractions. The Consultant shall propose such joint operational rules and illustrate their practicability and effects on power generation and other interventions, through the water balance model. The Consultant shall also, if relevant, propose improved erosion and contaminant control measures and show the effects of such on the riverine water quality in the rivers. The mitigation measures should also include proposal for monitoring and dissemination of key variables, such as river flows and standard water quality parameters, for self-monitoring and accountability. This monitoring should, as much as possible, be located at locations of existing gauging stations and where water quality measurements have been conducted as part of this study (see Task 4). Recommendations for improved joint management in the river basins shall be made within the legal and institutional framework of the present river basin management in the [number] rivers and as much as possible in liaison with [ministry in charge of natural resources and environment] and the people committees.

### Task 12 – Report on Cumulative Impacts and Possible Mitigation Measures:

The Consultant shall summarize all results and conclusions of the detailed cumulative impact assessments and proposed mitigation measures for the chosen rivers in a draft report to be presented to the [ministry in charge of natural resources and environment], the [ministry in charge of trade and industry] and other relevant stakeholders at a workshop in the [country]. Taking into account the comments and suggestions from this workshop the Consultant shall finalize the report.

#### Phase III – Develop Joint Basin Operational Rules

Task 13 – Formulate Joint Operational Rules:

The Consultant shall base on the results of the detailed cumulative impact assessment and tests of mitigation measures, formulate proposed operational rules for each major hydraulic infrastructure scheme. The proposed operational rules should have the main objective of optimized joint management of the basin. Existing schemes and agreed rules should be taken into account as much as possible to enable applicable rules and wide ownership. They should cover management during construction and operational as well as under normal and extreme climate conditions. The rules should include both the operation of hydraulic gates, pumps, etc., as well as a description of roles and responsibilities and way of communication between stakeholders under these conditions.

Task 14 – Consultation with Local Operators:

The Consultant shall present the draft joint operational rules at local workshops for each of the river basins. The workshops should be designed to be interactive where the operators can give feedback, suggest changes and take ownership of the operational rules. Based on the feedback the Consultant shall update the proposed operational rules and document them for each of the river basins.

## Workplan and Deliverables

The assignment is expected to start in [date] and should last 12 calendar months. The consultant shall produce the following deliverables:

* Inception Report
* Draft Screening Report
  + Draft Screening Report on Cumulative Impacts in the [number] rivers
  + Final Screening Report on Cumulative Impacts in the [number] rivers
* CIA for the River Basins
  + Draft CIA for the river basins and recommended mitigation measures
  + Final CIA for the river basins including recommended mitigation measures
* Proposed Joint Operational Guidelines for each of the river basins
* Updated ESF and EMPs
* Presentations for workshop and reports

## Consultant Team and Level of Effort

The consultant team shall be a mix of international and local specialists. The team leader shall be an international experienced EIA expert and will lead the team and be responsible for coordinating and reviewing all reports prepared by the team members. Individual experts shall at least cover the following areas: ecology, hydrology, social science, geology and morphology, hydropower engineering.

The inputs of all specialists shall be clearly indicated in the work plan to be carried out by individuals experienced in their professional fields and aligned with the tasks assigned.

The indicative level of effort for International Specialists is 45 man-weeks, and for local specialists 30 man-weeks.

## Consultant’s Qualifications

The assignment shall be undertaken by a domestic or international firm, or a consortium of both. The firm or consortium shall be able to demonstrate experience in hydrological and environmental studies for hydropower plants, a strong experience in river basin analysis and modeling, with a proven record of following international good practice and internationally recognized methodologies.

The Consultant team shall be led by an International EIA/CIA Specialist with a minimum of 15 years professional experiences in environmental assessments of infrastructure projects. He/she should have experience of studies of equivalent size projects, demonstrated ability to work with private developers, government officials, civil society organizations, and the public at large, and should have a proven track record on managing and coordinating a diverse group of professionals. He/she should have experiences in EIA/CIA and watersheds management and from work in the [country].

The Consultant team shall include an International Hydrologist or Water Resources Specialist with a minimum of 10 years professional experience of hydrological assessments for infrastructure projects. He/she should have experience of hydrological, water resources and hydropower modeling, and preferable experience from work in the [country] or [region].

The Consultant team shall include an International Geomorphologist or Engineering Geologist with a minimum of 10 years professional experience of morphological/geological assessments for infrastructure projects. He/she should have experience of solutions for slope stabilization, soil erosion protection, landslide protection and riverine sediment transport, and preferable experience from work in the [country] or [region].

The Consultant team should be supported by a strong team of local specialists, which have knowledge and experiences in relevant expertise such as e.g. ecology, hydrology, sociology, agriculture and/or rural development. The local consultants should have good [language] capacity and experiences in site survey, consultation skills, data collection and analysis.

The team should include necessary technical support in GIS and expertise for provision of professional and comprehensible reports.

1. **Client’s Services**

The [ministry in charge of industry and trade] is the main government counterpart for the study, assisting the Consultant with the following services:

* free and uninhibited access to the entire project area; unrestricted movement within the project area and to locations deemed relevant to carry out the assignment;
* access to all available relevant documents, reports, designs, drawings, maps and plans, and any other information on environmental situation or technical project design;
* assist the Consultant with contacts with the [ministry in charge of natural resources and environment], people committees and other relevant stakeholders, and in accessing information and data from other HPP and other developers in the [number] river basins.
* arrange the workshops (screening and CIA workshops as well as consultation workshops for joint operational rules). The Consultant needs to accommodate costs related to their own participation.

All costs for data and information, such as hydrological and rainfall data, sourced from other than the project, must be covered by the Consultant.

The Consultant will be expected to organize local office space including all utilities and consumables, communication, transport, domestic and international travel, and accommodation for personnel, and include the cost into the financial proposal.